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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/881,407	06/13/2001	Zhongze Wang	MI22-1670	8493

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WELLS ST. JOHN P.S.
601 W. FIRST AVENUE, SUITE 1300
SPOKANE, WA 99201

EXAMINER	
PERKINS, PAMELA E	
ART UNIT	**PAPER NUMBER**
2822	

DATE MAILED: 09/23/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/881,407	WANG, ZHONGZE	
	Examiner	Art Unit	
	Pamela E Perkins	2822	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *16 June 2004*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-5,26-35 and 61-67* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-5,26-35 and 61-67* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *6/16/04*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

This office action is in response to the filing of the amendment on 16 June 2004. Claims 1-5, 26-35 and 61-67 are pending; claims 6-25 and 36-43 have been cancelled.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1-4, 26-35 and 61-67 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chau in view of Buchannan et al. (6,566,281).

Chau discloses a method of forming a transistor device where a silicon-comprising surface of silicon dioxide (402) is exposed to activate nitrogen to convert the silicon-comprising surface (402) to a material comprising silicon and nitrogen (416); the activated nitrogen being formed by exposing a nitrogen-containing precursor to a plasma maintained at a power of 500 watts to 2,000 watts; providing a channel region (230, 270) on one side of the silicon and nitrogen surface (220, 260); forming a plurality of PMOS (250) or NMOS (210) transistor gate structures on a side of the silicon and nitrogen surface (220, 260) opposed to the one side and forming a pair of source and drain regions (216, 256) separated from one another by the channel region (230, 270) (col. 3, line 4 thru col. 6, line 20).

Chau further discloses dividing the transistor gate structures into a first group and a second group and forming a mask (508) over the second group during the exposure step (Fig. 5D; col. 7, lines 33-63). Chau also discloses the plasma as a remote relative to the silicon-comprising surface and the plasma contacting the silicon-comprising surface (col. 6, line 67 thru col. 7, line 3). Chau discloses implanting a dopant into the channel region with a concentration between $1x10^{16}$ atoms/cm^3 to $1x10^{17}$ atoms/cm^3 (col. 5, lines 48-65). Chau does not disclose the activated nitrogen forming a peak concentration of at least 15 atomic %.

Buchannan et al. disclose a method of forming a transistor device where a silicon-comprising surface is exposed to activate nitrogen to convert the silicon-comprising surface to a material comprising silicon and nitrogen (col. 7, lines 48-67). Buchannan et al. further disclose the activated nitrogen having a concentration of about 15 atomic % (col. 8, lines 1-10).

Since Chau and Buchannan et al. are both from the same field of endeavor, a method of forming a transistor device, the purpose disclosed by Buchannan et al. would have been recognized in the pertinent art of Chau. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Chau by the activated nitrogen having a concentration of about 15 atomic % as taught by Buchannan et al. to prevent diffusion into the substrate (col. 3, lines 26-51).

Referring to claim 32, Chau discloses the power in which the plasma is maintained of claim 32 wherein the power is between 500 watts and 2,00 watts. It is noted that the specification contains no disclosure of either the critical nature of the

claimed concentrations or any unexpected results arising there from. It would have been obvious to one of ordinary skill in the art to maintain the plasma at a power between 1,500 watts and 5,00 watts since it has been held that "In such an situation, the applicant must show that the particular range is critical, generally by showing that the claimed range achieves unexpected results relative to the prior art range." In re Woodruff, 919 F.2d 1575, 16 USPQ2d 1934 (Fed. Cir. 1990) See MPEP § 2144.05.

Referring to claim 35, Chau discloses the temperature in which the silicon-comprising surface is maintained of claim 35 wherein the temperature is 800 ^{o}C. It is noted that the specification contains no disclosure of either the critical nature of the claimed concentrations or any unexpected results arising there from. It would have been obvious to one of ordinary skill in the art to maintain the temperature of the silicon-comprising surface between 25 ^{o}C and 400 ^{o}C since it has been held that "In such an situation, the applicant must show that the particular range is critical, generally by showing that the claimed range achieves unexpected results relative to the prior art range." In re Woodruff, 919 F.2d 1575, 16 USPQ2d 1934 (Fed. Cir. 1990) See MPEP § 2144.05.

Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over Chau in view of Buchannen et al. as applied to claim 1 above, and further in view of Schindler et al. (5,962,069).

Chau in view of Buchannan et al. disclose the subject matter claimed above except annealing the silicon and nitrogen surface at a temperature of about 900 ^{o}C for a

time between 10 seconds and 60 seconds, by rapid thermal processing at a temperature ramp rate of at least 10 ^{o}C/second.

Schindler et al. disclose a method of forming a transistor device where a silicon and nitrogen layer is formed on a substrate. Schindler et al. further disclose annealing the silicon and nitrogen surface at a temperature between 500 ^{o}C and 850 ^{o}C for a time between 5 seconds and 300 seconds, by rapid thermal processing at a temperature ramp rate between 1 ^{o}C/second and 175 ^{o}C/second (col. 10, lines 29-61).

Since Chau and Schindler et al. are both from the same field of endeavor, a method of forming a transistor device, the purpose disclosed by Schindler et al. would have been recognized in the pertinent art of Chau. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Chau by annealing the silicon and nitrogen surface at a temperature between 500 ^{o}C and 850 ^{o}C for a time between 5 seconds and 300 seconds, by rapid thermal processing at a temperature ramp rate between 1 ^{o}C/second and 175 ^{o}C/second as taught by Schindler et al. to prepared the surface for further processing steps (col. 10, lines 29-61).

Response to Arguments

Applicant's arguments, see the paper filed 16 June 2004, with respect to the rejection(s)of claim(s) 1, 26 and 61 under 35 U..S.C. 103 (a) has been fully considered and is persuasive. Therefore, the rejection has been withdrawn. However, upon further

consideration, a new ground(s) of rejection is made in view of Buchannan et al. (U.S. Patent No. 6,566,281).

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Yasuda et al. (6,756,635), Koyama et al. (6,492,681) and Kuroda et al. (6,342,754) are disclose a method of forming a transistor device where a silicon-comprising surface of silicon dioxide is exposed to activate nitrogen to convert the silicon-comprising surface to a material comprising silicon and nitrogen. Yasuda et al., Koyama et al. and Kuroda et al. further disclose the activated nitrogen having a concentration of about 15 atomic %.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Pamela E Perkins whose telephone number is (571) 272-1840. The examiner can normally be reached on Monday thru Friday, 9:00am to 5:30pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Amir Zarabian can be reached on (571) 272-1852. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

PEP

AMIR ZARABIAN
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2800